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EXAMINER	
DIAMOND, ALAN D	

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 03/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/645,747	MCFARLAND, ERIC W.	
	Examiner	Art Unit	
	Alan Diamond	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 January 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5,7,8,13-19,21,23,25,31,33-37,42,47,50-56,59 and 97-101* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5,7,8,13-19,23,25,31,33-37,42,47,50-56,59 and 97-101* is/are rejected.

7)☒ Claim(s) *21 and 33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Comments

1. The objection to the specification has been overcome by Applicant's amendment thereof.

2. The obviousness-type double patenting rejection over U.S. 6,774,300 and the provisional obviousness-type double patenting rejection over Serial No. 10/750,015 have been overcome by the terminal disclaimers filed January 13, 2005.

Suggested Claim Language

3. In claim 15, at line 3, the term "a group including" should be changed to "the group consisting of" so as to be consistent with Markush practice. In claim 25 at line 3, in claim 36 at line 4, and in claim 37 at line 3, the term "from the group including" should be changed to "from the group consisting of" so as to be consistent with Markush practice.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 55 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 55 is indefinite because it is not clear which layer is being referred to by the term "the conducting layer" at lines 3-4.

Claim Rejections - 35 USC § 102/103

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-3, 5, 13-15, 17, 19, 23, 31, 35, 36, 42, 50, 51, 53, 56, 97, 98, 100, and 101 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Skotheim, U.S. Patent 4,442,185.

As seen in Figures 13 and 14, Skotheim '185 teaches a photoelectric device comprising a layer of n-type semiconductor (131) which reads on the instant light energy conversion layer; a 5-50 angstrom platinum layer (135); a highly conductive layer (134) of polymer blend (i.e., non-metal); and a p-type semiconductor layer (132), such as silicon, or germanium, etc, which reads on the instant charge separation layer (see also col. 15, lines 33-64; and col. 17, line 25). It is the Examiner's position that either said platinum layer (135), or said highly conductive layer (134), or the

combination of the platinum layer (135) and highly conductive layer (134), reads on the conducting layer in claim 1, on the front contact layer in claim 31, an on the front conducting layer in claim 97, and inherently provides ballistic transport of charge carriers from the n-type semiconductor layer (131) to the p-type semiconductor layer (132). The back contact layer on the right side of p-type semiconductor layer (132) can be a metal, and it is the Examiner's position that said back contact is an ohmic contact (see col. 16, lines 19-29). As seen, for example, in layer 72 in Figure 7, layer 82 in Figure 8, and the lightly doped n layer in Figure 10, it is the Examiner's position that charge carriers will be in the form of photon excited electrons e^- and holes h^+, as per instant claims 2 and 3.

With respect to claims 17 and 53, it is the Examiner's position that said 5-50 angstrom platinum layer (135) and/or said highly conductive layer (134) of polymer blend is inherently transparent.

With respect to claim 19, it is the Examiner's position that said platinum layer (135), or said highly conductive layer (134), or the combination of the platinum layer (135) and highly conductive layer (134), inherently forms a tunnel junction with the p-type semiconductor layer (132).

With respect to claim 98, it is the Examiner's position that the n-type semiconductor (131), formed of photoexcitable silicon (i.e., instant photoexcitable molecular species), or germanium etc, enables charge carriers to be ballistically transported from said n-type semiconductor layer (131) to said p-type semiconductor layer (132).

Since Skotheim teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

In addition, the presently claimed limitation that the conducting layer (front contact; front conducting layer) provides ballistic transport of charge carriers from the light energy conversion layer to the charge separation layer, and the requirements of a tunnel junction, ohmic contact, transparency, photon excited electrons e^- and holes h^+, and photoexcitable molecular species would obviously have been present once Skotheim '185's photovoltaic device is provided. Note In re Best, 195 USPQ at 433, footnote 4 (CCPA 1977) as to the providing of this rejection under 35 USC 103 in addition to the rejection made above under 35 USC 102.

9. Claims 1-3, 5, 7, 8, 14, 15, 17-19, 23, 25, 31, 34, 35, 37, 42, 47, 51, 53, 54, 56, 59, and 97-101 are rejected under 35 U.S.C. 102(e) as being anticipated by Han, U.S. Patent U.S. 6,150,605.

Han teaches a photovoltaic cell comprising a porous photovoltaic layer (3) that reads on the instant light energy conversion layer; an electrically conductive film (5) that, it is the Examiner's position, reads on the instant conducting layer, front contact, or front conducting layer, and that can be made from, for example, a hole-transporting material such as polyvinylcarbazole or an electrically conductive polymer (electron transporter) such as polypyrrole; and a second porous photovoltaic layer (7) that reads on the instant charge separation layer; wherein one of the first and second photovoltaic layers is n-type semiconductor and the other is p-type semiconductor (see col. 2, line 48 through col. 3, line 31; the paragraph bridging cols. 5 and 6; and Figure 1). Note that

the device also has a back electrode (8), which, it is the Examiner's position, is an ohmic contact (see Figure 1; and col. 5, line 66). It is the Examiner's position that said electrically conducting film (5) inherently provides ballistic transport of charge carriers (holes or electrons) from photovoltaic layer (3) to photovoltaic layer (7).

With respect to claim 7, mixtures of semiconductor particles can be used in both photovoltaic layers (3) and (7), and thus there can be a "plurality of photosensitive structures" (see col. 3, line 20).

With respect to claims 8 and 47, and as seen in Figure 1, the photovoltaic layer (3) is embedded in the conductive layer (5).

With respect to claims 17 and 53, it is the Examiner's position that the polyvinylcarbazole or polypyrrole electrically conductive layer is inherently transparent.

With respect to claim 19, it is the Examiner's position that Han's conductive layer (5) and the photovoltaic layer (7) inherently form a tunnel junction.

With respect to claims 18, 34, and 54, it is the Examiner's position that Han's semiconductor layer (3) and conductive layer (5) inherently for a Schottky barrier, with one functioning as p-type and the other functioning as n-type depending on the materials that are selected.

With respect to claim 23 and 56, both photovoltaic layers (3,7) can be made from inorganic semiconductors (see col. 3, lines 3-20).

With respect to claims 25 and 59, the charge separation layer can be considered to be the combination of layers (7,8,9) which has glass (insulator) substrate (9)

deposited on metal (8) and semiconductor (7) (see col. 2, lines 53-64; col. 3, lines 3-20; and Figure 1).

With respect to claim 31, it is the Examiner's position that Han's electrically conductive film (5) inherently it "ultra-thin", particular in view of the fact that electrons and holes move to the respective semiconductor films (3,7) via said transparent electrically conductive layer (5) (see col. 6, lines 1-4).

With respect to claim 37, note that the semiconductor for the layers (3,7) can be titanium oxide (i.e., dioxide), tungsten oxide, etc (see col. 3, lines 12-21).

With respect to claim 41, note that the semiconductor layers (3,7) can have a thickness of 0.3 to 50 microns (see col. 3, lines 39-41).

With respect to claim 98, there is a photoexcitable colorant (4) deposited on the electrically conductive layer (5), which, it is the Examiner's position, enables said ballistic transport (see Figure 1; and col. 4, lines 6-59).

With respect to claim 99, electrically conductive layer (5) also has semiconductor layer (3) on its surface, and said semiconductor layer (3) is formed from nanoparticles, which read on the instant nanostructures (see col. 3, lines 43-52; and col. 6, line 27).

Since Han teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

In addition, the presently claimed limitation that the conducting layer (front contact; front conducting layer) provides ballistic transport of charge carriers from the light energy conversion layer to the charge separation layer, and the requirements of a tunnel junction, ohmic contact, transparency, photon excited electrons e^- and holes h^+,

and Schottky barrier would obviously have been present once Han's' photovoltaic device is provided. Note In re Best, 195 USPQ at 433, footnote 4 (CCPA 1977) as to the providing of this rejection under 35 USC 103 in addition to the rejection made above under 35 USC 102.

Claim Rejections - 35 USC § 103

10. Claims 16 and 52 rejected under 35 U.S.C. 103(a) as being unpatentable over Han (U.S. Patent US 6,150,605) in view of Coleman (U.S. Patent 5,413,739).

Han teaches a photovoltaic cell comprising a porous photovoltaic layer (3) that reads on the instant light energy conversion layer; an electrically conductive film (5) that, it is the Examiner's position, corresponds the instant conducting layer or front contact and that can be made from, for example, an electrically conductive polymer such as polypyrrole; and a second porous photovoltaic layer (7) that reads on the instant charge separation layer; wherein one of the first and second photovoltaic layers is n-type semiconductor and the other is p-type semiconductor (see col. 2, line 48 through col. 3, line 31; the paragraph bridging cols. 5 and 6; and Figure 1). Note that the device also has a back electrode (8), which, it is the Examiner's position, is an ohmic contact (see Figure 1; and col. 5, line 66). It is the Examiner's position that said electrically conducting film (5) inherently provides ballistic transport of charge carriers (holes or electrons) from photovoltaic layer (3) to photovoltaic layer (7). Han teaches the limitations of the instant claims other than the difference which is discussed below.

Han does not specifically teach that its electrically conductive film (5) can be a metal oxide. Coleman teaches what is very well known that ITO is a conductive

material that can be substituted for polypyrrole (see col. 2, lines 58-65). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used ITO as the conductive material for Han's conductive film (5) because, as shown by Coleman, ITO is electrically conductive and can be substituted for a conductive material such as polypyrrole. As noted above, Han discloses polypyrrole as an example of its electrically conductive material.

Response to Arguments

11. Applicant's arguments filed January 13, 2005 have been fully considered but they are not persuasive.

Applicant argues that Skotheim's n-type semiconductor layer (131) causes electrical conduction due primarily to movement of negative electrons and therefore does not specifically teach the claimed light energy conversion layer of claims 1, 31, and 97. However, this argument is not deemed to be persuasive because said n-type semiconductor layer (131) does read on the instant "light energy conversion layer". In an n-type semiconductor layer, light absorbed by the semiconductor goes to the generation of electron-hole pairs, with freed electrons remaining in the n-type semiconductor, and the holes going to the p-type semiconductor.

Applicant argues that Skotheim does not teach or suggest the charge separation layer because the p-type semiconductor layer (132) of Skotheim causes electrical conduction due primarily to movement of positive holes and therefore does not specifically teach to the charge separation layer of claims 1, 31, and 97. However, this argument is not deemed to be persuasive because said p-type semiconductor layer

(132) is a charge separation layer. In a p-type semiconductor layer, there is charge separation due to the generation of electron-hole pairs, with holes remaining in the p-type semiconductor, and the electrons going to the n-type semiconductor.

Applicant argues that Skotheim does not disclose a two-sided conducting layer. However, this argument is not deemed to be persuasive because, as noted above in the instant Final Rejection, it is the Examiner's position that either Skotheim's platinum layer (135), or the highly conductive layer (134), or the combination of the platinum layer (135) and highly conductive layer (134), reads on the conducting layer in claim 1, on the front contact layer in claim 31, an on the front conducting layer in claim 97. As seen in Skotheim's Figure 14, the platinum layer (135) is two sided. As seen in Skotheim's Figures 13 and 14, the highly conductive layer (14) is two-sided. Likewise, the combination of the platinum layer (135) and highly conductive layer (134) is two-sided, as seen in Figures 13 and 14.

Applicant argues that Skotheim teaches away from the claimed invention because Skotheim's conducting layer requires the use of electrolyte to complete electrical conduction, "whereas the conducting layer of the claimed art, the two-sided conducting layer of Claim 1, the front contact layer in Claim 31, and the front conducting layer of Claim 97, eliminate the need for an electrolyte." However, this argument is not deemed to be persuasive because the recitation "eliminates the need for an electrolyte" does not exclude an electrolyte from the instant claims. The electrolyte can still be present in the instant claims, but it is not a required component.

Applicant argues that "[t]he last six lines of page 4 of the Office Action are not understood, as they do not reference any specific claims." However, this argument is not deemed to be persuasive because the last six lines of page 4 are clear. These lines recite the following: "The back contact layer on the right side of p-type semiconductor layer (132) can be a metal, and it is the Examiner's position that said back contact is an ohmic contact (see col. 16, lines 19-29). As seen, for example, in layer 72 in Figure 7, layer 82 in Figure 8, and the lightly doped n layer in Figure 10, it is the Examiner's position that charge carriers will be in the form of photon excited electrons e^- and holes h^+, as per instant claims 2 and 3." The only instant claims an ohmic contact is recited are claims 35 and 101, and Applicant has not provided any good reason or any evidence why Skotheim's back metal contact layer would not be an ohmic contact. The sentence at the last four lines on said page 4 of the Office Action are clearly directed to instant claims 2 and 3.

Applicant argues that the statement made in the last paragraph on page 5 of the Office Action is vague. However, this argument is not deemed to be persuasive because said last paragraph is not vague. The entire rejection over Skotheim starting at the top of page 4 and ending at the bottom of page 5 of the Office Action is under 35 USC 102(b)/103(a) and involves inherency, and Applicant has not established by effective argument or objective evidence that the claimed invention distinguishes over Skotheim.

Applicant argues that Han teaches away because Han "requires an electrically conducting film or electrode (col. 2, line 50, and col. 5, line 60-62) to receive light before

the photovoltaic layer (3), whereas the claimed invention does not require an electrically conducting film to receive light before the claimed light energy conversion layer." However, this argument is not deemed to be persuasive because said electrically conducting film or electrode is not excluded by the "comprising" language of the instant claims.

Applicant argues that "[r]esponsive to the statement in the Office Action asserting that an electrically conducting film (5) reads on the claimed conducting layer of claim 1, the front contact layer of Claim 31 or the front conducting layer of claim 97, Applicant respectfully traverses the rejection as vague, Applicant is unclear which element of the cited prior art the Examiner is citing to." However, this argument is not deemed to be persuasive because said rejection is not vague, but rather is very clear and is referring to Han's electrically conductive film (5). The Office Action clearly states "an electrically conductive film (5) that, it is the Examiner's position, reads on the instant conducting layer, front contact, or front conducting layer, and that can be made from, for example, a hole-transporting material such as polyvinylcarbazole or an electrically conductive polymer (electron transporter) such as polypyrrole". The Office Action also states "[i]t is the Examiner's position that said electrically conducting film (5) inherently provides ballistic transport of charge carriers (holes or electrons) from photovoltaic layer (3) to photovoltaic layer (7)."

Applicant argues that "[i]f the Examiner is citing to the electrically conductive layer (5), Applicant respectfully submits that the cited prior art teaches away from the claimed invention." Applicant argues that the cited element requires a colorant film

between the photovoltaic layer (3) and the conductive layer (5), and that the claimed invention does not require a separate colorant film, or in the alternative does not require any colorant. However, these arguments are not deemed to be persuasive because Han does not teach away from the claimed invention. Han's colorant film between the photovoltaic layer (3) and the conductive layer (5) is not excluded by the "comprising" language of the instant claims.

Applicant argues that Han teaches away because Han requires a colorant on one side of the second photovoltaic layer (7) and an additional conductive film in order to complete energy conduction "whereas the claimed charge separation layers do not require a colorant or additional conductive film to complete the light energy conversion." However, this argument is not deemed to be persuasive because said colorant on one side of the second photovoltaic layer (7) and said additional conductive film are not excluded by the "comprising" language of the instant claims.

Applicant argues that the Examiner's position that Han's back electrode (8) is an ohmic contact is vague because Applicant is unclear which claim the Examiner contends the cited prior art reads on. However, this argument is not deemed to be persuasive because the only instant claims an ohmic contact is recited are claims 35 and 101, and Applicant has not provided any good reason or any evidence why Han's back electrode (8) would not be an ohmic contact.

Applicant argues that "[a]ssuming the Examiner contends that the back electrode, described as conductive film (8), of the cited prior art reads on the electrically conductive metal back of Claim 31 and the two-sided back conducting layer of claim 97,

Applicant respectfully submits that the cited prior art is nonenabling as the cited element is not sufficiently described." However, this argument is not deemed to be persuasive because it is the Examiner's position that Han is a fully enabled U.S. and the cited element is sufficiently described.

Applicant argues that Han teaches away because Han requires a separate colorant film in conjunction with the conductive film (8). However, this argument is not deemed to be persuasive because said separate colorant film is not excluded by the "comprising" language of the instant claims.

With respect to Han in view of Coleman, Applicant argues that Han teaches away fro the claimed invention because the conducting layer of the cited prior art requires the use of an electrolyte whereas the conducting layers of the claimed art in claims 16 and 62 eliminate the need for an electrolyte. However, this argument is not deemed to be persuasive because the recitation "eliminates the need for an electrolyte" in the instant claims does not exclude an electrolyte from the instant claims. An electrolyte can still be present in the instant claims, but it is not a required component.

Allowable Subject Matter

12. Claims 21 and 33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 571-272-1338. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alan Diamond
Primary Examiner
Art Unit 1753

Alan Diamond
March 28, 2005